

Catalyst Measurement

Version 2017-05-08

Color Coding Legend

Data Entry Cell	Calculated Cell	Percent Difference	Area of Concern	Instrument Calibration Out of Range
RED - Data Measurements taken by EPA Region 9				

Daily Calibration Results

Engine Family	JHSNX.229A15
VIN/Serial No.	LWGMNDL18JA000203 (1801050-01)
Task Directive	TD 2, Opt. 2
Entry Number	9AR-02893576
Inspection Number	1801050-01
Catalyst Inspection Date	2/12/2018
Certificate Catalyst Manufacturer	BASF Catalysts (Guilin) Co., Ltd.
Certificate Catalyst Part Number	18601-120-0000
Observed Catalyst Markings	N/A - R9 Washcoat Samples

Instrument Used	Mitutoyo Calipers (SN: 04427304)
Date of Last Simco Calibration (must be < 1 year)	5/11/2017

	End Rod Result	Accuracy (mm)
25 mm End Rod	N/A	#VALUE!
50 mm End Rod	N/A	#VALUE!
75 mm End Rod	N/A	#VALUE!

	1st Measured Value (mm)	2nd Measured Value (mm)	3rd Measured Value (mm)	4th Measured Value (mm)
Diameter: outside of exhaust piping	--	--	--	--
Diameter: outside of catalyst casing	--	--	--	--
Diameter: inside of catalyst casing (catalyst diameter)	--	--	--	--
Length: exhaust piping	--	--	--	--
Length: catalyst casing	--	--	--	--
Length: catalyst material	--	--	--	--
Inset: catalyst casing (side 1)	--	--	--	--
Inset: catalyst casing (side 2)	--	--	--	--
Inset: catalyst substrate (side 1)	--	--	--	--
Inset: catalyst substrate (side 2)	--	--	--	--

Calculated Average Value (mm)	Percent Difference	Certificate Values
--	--	
--	--	
42.51	--	
--	--	
--	--	
95.13	--	
--	--	
--	--	
--	--	

Counted cells (total)	424
Avg. inside diameter of casing (in)	1.67

volume cc	134.99	--	
cells/in ²	192.78	--	

Comments	- ERG did not measure the dimensions of the catalyst sample.
Areas of Concern	None
Photo Used for Counts	N/A
Inspector:	N/A
ERG Reviewer:	N/A
Report Date:	N/A

Honeycomb Catalyst Precious Metals Analysis

Version 2017-05-08

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Observed Catalyst Markings	N/A - R9 Washcoat Samples

Legend			
Data Entry Cell	Result Calculation	Instrument Calibration Out of	LOD - limit of detection
RED - Data measurements taken by EPA Region 9			

Daily Check Standard Results

Instrument Used	X-5000 (S/N: 202212)	Measured Value (% concentration)	Measured Value (ppm)	Known Concentration Value (ppm)	Percent Difference (Measured vs. Known Value)	Control Charting Checks
Calibration Curve Name	Metallic Curve 2016-01-19					
Check Standard ID	Ledoux-11					
	Pt	0.227	2,274	2,021	12.52%	OK
	Pd	1.259	12,592	12,474	0.95%	OK
	Rh	0.121	1,207	1,192	1.26%	OK

Measured Precious Metals Concentrations with X5000, Measured by ERG

	Measured Value (%) concentration, by weight	x-5000 LOD (%) Concentration by weight	Measured Value (ppm)	x-5000 LOD (ppm)
Pt	0.1854	0.0056	1,854	56
Pd	0.5853	0.0069	5,853	69
Rh	0.0878	0.0021	878	21
Ce	42.9000	0.4600	429,000	4,600
Zr	12.2400	0.1300	122,400	1,300

Certified Precious Metals Data

	Reported Cert Ratio	Reported Cert Loading Value	Reported Cert Loading Value Units	Calculated Cert. Loading Value (g/L)	Calculated Ratio from Measurement	Cert Ratio	Difference (%) (Measured Vs. Certified)
Pt					2.1		
Pd					6.7		
Rh					1.0		
Total:			g/ft^3				

Material Weight Reconciliation, Measured by EPA Region 9

Pre-Extraction/Separation Weights (g)		Post-Extraction/Separation Weights (g)		Mass Balance Calculations Weights (g)		Percent Losses
Weight of Catalyst	--	Post Extraction: Weight of Catalyst	--	Theoretical PM and Ferrous Metals	--	
Empty Glass Vial (w/ lid)	--	Post Extraction: Glass Vial (w/ lid, PM, and ferrous metals)	--	Extracted PM and Ferrous Metals	--	
Empty Glass Vial (w/ lid)	--	Post Separation: Glass Vial (w/ lid and ferrous metal only)	--	Extracted Ferrous Metals	11.85	
Empty Sample Cup (no lid, no Mylar)	--	Sample Cup with PM (no lid or Mylar)	--	Extracted PM Sample	1.68	
				Total Material Lost	--	

Drilling Information, Measured by EPA Region 9

Hole #	Hole Diameter (inches)	Hole Length/Depth (mm)	Drilled Hole Volume (L)
Hole 1	--	--	
Hole 2	--	--	
Total Volume of Extraction Holes:			0.013761

Loading Results

	Calculated Extracted Powder Weight		Cert Value - Loading (g/L)	Calculated Metals Loading		Percent D Loadin
	Result (g)	LOD (+/- g)		Result (g/L)	LOD (+/- g/L)	Result (%)
Pt	0.00311	+/- 0.00009		0.226	+/- 0.007	
Pd	0.00983	+/- 0.00012		0.715	+/- 0.008	
Rh	0.00148	+/- 0.00004		0.107	+/- 0.003	
Total	0.01442	+/- 0.0002		1.048	+/- 0.018	

Test Conditions	3 runs, 90 seconds each
Check Standards	The check standard results passed all daily control charting checks.
Comments:	- US EPA Region 9 Laboratory provided data highlighted in red ("Extracted Ferrous Metals", "Extracted PM Sample", and "Drilled Hole Volume"). ERG measured concentrations of the sample and calculated the PM loading with the data provided by the Region 9 Laboratory.

Pt Qualifiers	None
Pd Qualifiers	None
Rh Qualifiers	None
Ratios:	The calculated ratio for Pt : Pd : Rh was 2.1 : 6.7 : 1 and the reported certified ratio was
Pt Loading:	The calculated Pt loading was less than the certified value.
Pd Loading:	The calculated Pd loading was less than the certified value.
Rh Loading:	The calculated Rh loading was less than the certified value.
Total Loading:	The calculated total loading was less than the certified value.
Areas of Concern	None
Related Photo(s)	DSCN8026.JPG - DSCN8029.JPG
Inspector(s):	Aasim Rawoot
ERG Reviewer:	Brent Ruminski
Report Date:	2/19/2018

Honeycomb Catalyst Precious Metals Analysis

Version 2017-05-08

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Inspection Number	1801050-01
Catalyst Inspection Date	2/12/2018
Certificate Catalyst Manufacturer	BASF Catalysts (Guilin) Co., Ltd.
Certificate Catalyst Part Number	18601-120-0000
Observed Catalyst Markings	N/A - R9 Washcoat Samples

Measured Precious Metals Concentrations with X5000, Measured by ERG

	Measured Value (% concentration, by weight)	x-5000 LOD (% Concentration by weight)	Measured Value (ppm)	x-5000 LOD (ppm)
Pt	0.0025	0.0005	25	5
Pd	0.0117	0.0003	117	3
Rh	<LOD	0.0031	<LOD	31
Ce	<LOD	1.1700	<LOD	11,700
Zr	0.6205	0.0024	6,205	24

Material Weight Reconciliation, Measured by EPA Region 9

Pre-Extraction/Separation Weights (g)		Post-Extraction/Separation Weights (g)		Mass Balance Calculations Weights (g)		Percent Losses
Weight of Catalyst	--	Post Extraction: Weight of Catalyst	--	Theoretical PM and Ferrous Metals	--	
Empty Glass Vial (w/ lid)	--	Post Extraction: Glass Vial (w/ lid, PM, and ferrous metals)	--	Extracted PM and Ferrous Metals	--	
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				Total Material Lost	--	

Drilling Information, Measured by EPA Region 9

Hole #	Hole Diameter (inches)	Hole Length/Depth (mm)	Drilled Hole Volume (L)
Hole 1	--	--	
Hole 2	--	--	
Total Volume of Extraction Holes:			0.013761

Loading Results

	Calculated Extracted Powder Weight		Cert Value - Loading (g/L)	Calculated Metals Loading		Percent D Loadin
	Result (g)	LOD (+/- g)		Result (g/L)	LOD (+/- g/L)	
Pt	0.00030	+/- 0.00006		0.022	+/- 0.004	
Pd	0.00139	+/- 0.00004		0.101	+/- 0.003	
Rh	<LOD	+/- 0.00037		<LOD	+/- 0.027	
Total	0.00168	+/- 0.0005		0.122	+/- 0.034	

Test Conditions	3 runs, 90 seconds each
Check Standards	The check standard results passed all daily control charting checks.
Comments:	- MSEB's SOP does not include a calibration curve that is compatible with matrices containing ferrous metals. - US EPA Region 9 Laboratory provided data highlighted in red ("Extracted Ferrous Metals", "Extracted PM Sample", and "Drilled Hole Volume"). ERG measured concentrations of the sample and calculated the PM loading with the data provided by the Region 9 Laboratory.
Pt Qualifiers	The measured concentration of Pt in the compliance sample (25 ppm) was outside the x-5000 calibration curve range (161 - 10239 ppm).
Pd Qualifiers	None
Rh Qualifiers	The measured concentration of Rh in the compliance sample was below the X-5000 LOD.
Ratios:	--
Pt Loading:	--
Pd Loading:	--
Rh Loading:	--
Total Loading:	--
Areas of Concern	None
Related Photo(s)	DSCN8026.JPG - DSCN8029.JPG
Inspector(s):	Aasim Rawoot
ERG Reviewer:	Brent Ruminski
Report Date:	2/19/2018

Legend

Data Entry Cell	Result Calculation	Instrument Calibration Out of	LOD - limit of detection
RED - Data measurements taken by EPA Region 9			

Daily Check Standard Results

	Measured Value (% concentration)	Measured Value (ppm)	Known Concentration Value (ppm)	Percent Difference (Measured vs. Known Value)	Control Charting Checks
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Pd	1.259	12,592	12,474	0.95%	OK
Rh	0.121	1,207	1,192	1.26%	OK

Certified Precious Metals Data

	Reported Cert Ratio	Reported Cert Loading Value	Reported Cert Loading Value Units	Calculated Cert. Loading Value (g/L)	Calculated Ratio from Measurement	Cert Ratio	Difference (%) (Measured Vs. Certified)
Pt				0.2649	NA		
Pd				1.1919	NA		
Rh				0.1324	0.0		
Total:			g/ft^3	1.5892			

Catalyst Part Number

N/A - R9 Washcoat Samples

Cell Count Photo

N/A - R9 Washcoat Samples

Drilled Hole Photo

N/A - R9 Washcoat Samples